CAM 3.5 Forecasts for TWP-ICE

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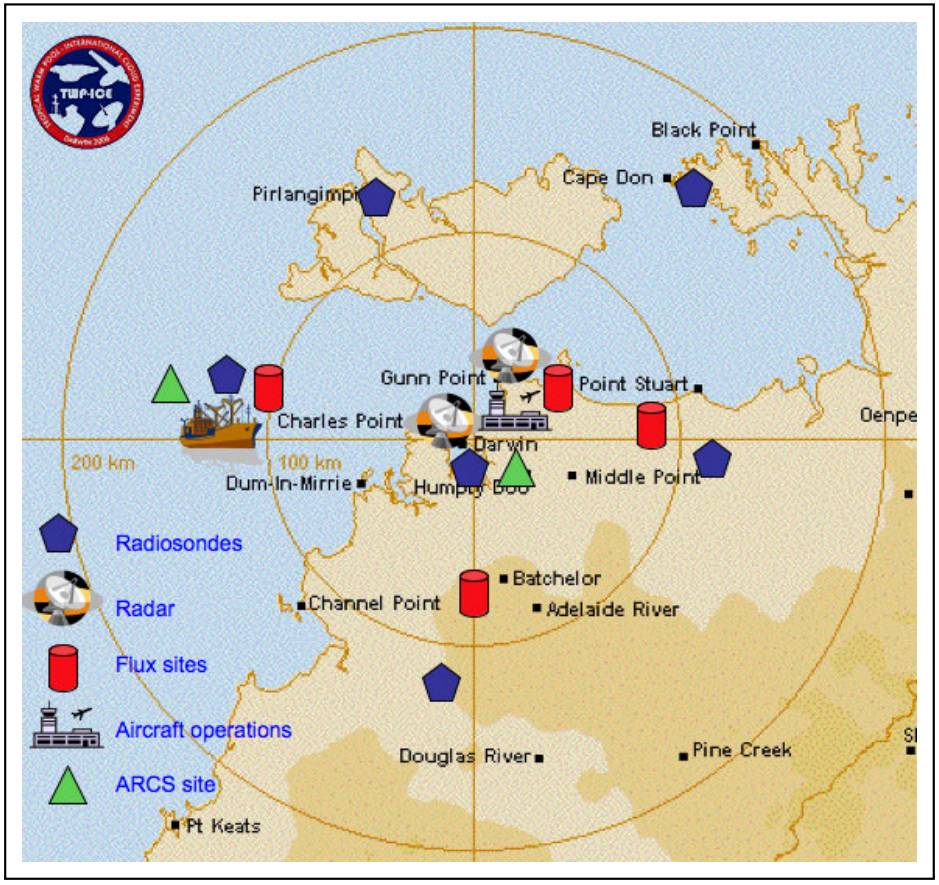
Outline

- Overview of Tropical Warm Pool-International Cloud Experiment TWP-ICE
- Forecast Initialization and Setup
- Results - Five CAM configurations, 2 day forecasts

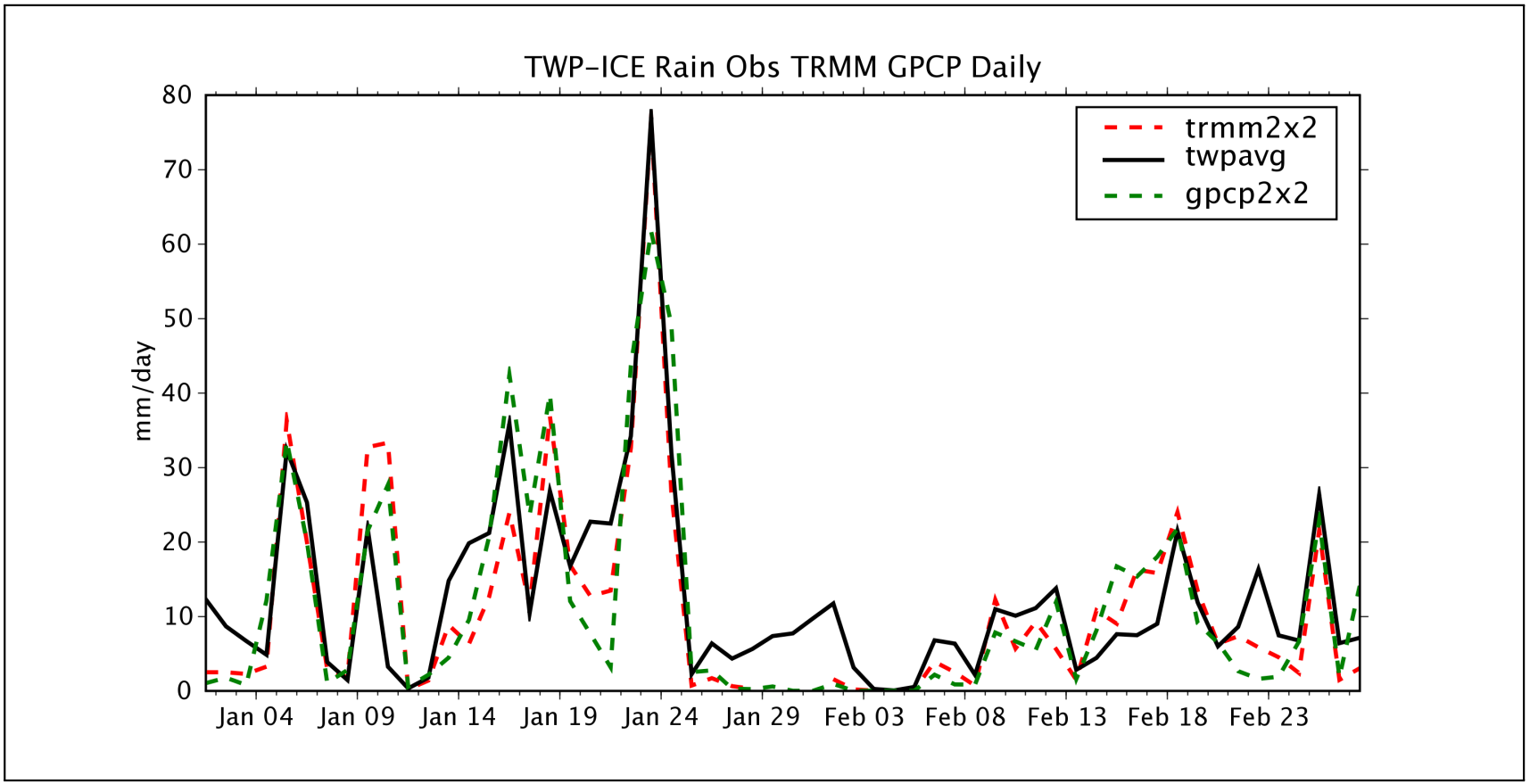
Tropical Warm Pool-International Cloud Experiment - TWP-ICE

- 19 Jan to 13 Feb 2006
- Observational array centered at Darwin.
  Millimeter Cloud Radar (MMCR) 35GHz
  Micropulse Lidar (MPL) 532 nm
  Microwave Radiometer (MWR)
  Atmospheric Emitted Radiance Interferometer (AERI)
  BOM precipitation radars

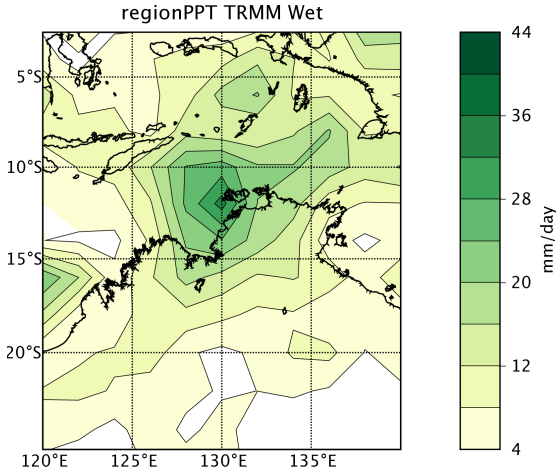


Tropical Warm Pool-International Cloud Experiment

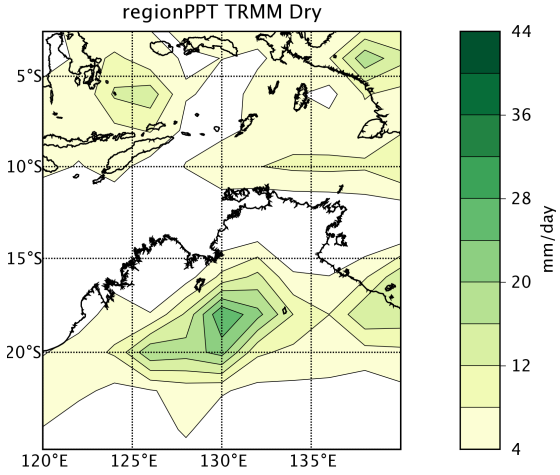
- 13 - 25 January Wet Monsoon across Northern Australia
- 26 January - 2 February Dry Monsoon (LandFoon)
- 3 - 13 February Break Monsoon Period



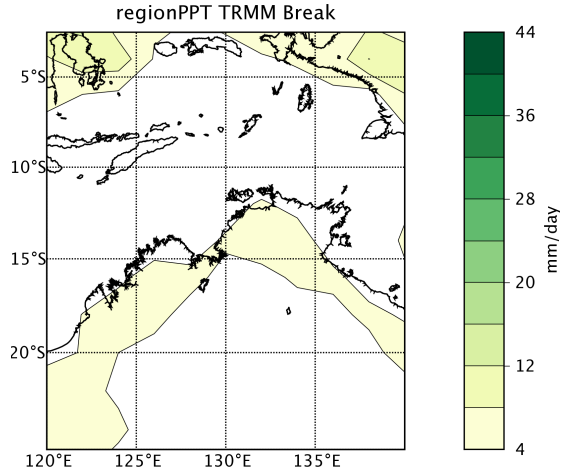
Rainfall - TRMM



(a) Wet



(b) Dry



(c) Break

Forecast Protocol

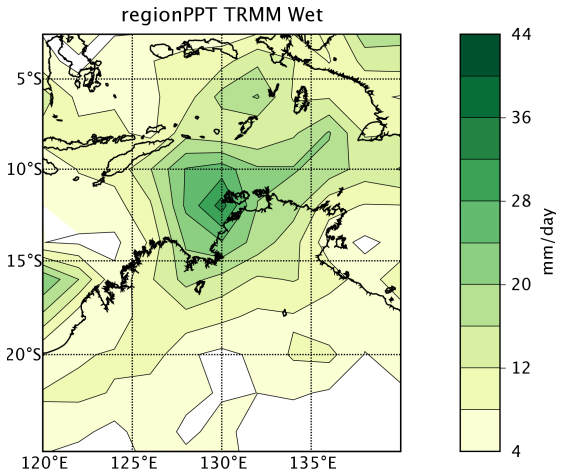
- Forecasts initialized every 6h using ECMWF operational analyses. 1.125° x 1.125° , 91 Levels
- Temperature, Moisture, surface pressure and winds are updated. land allowed to run freely.
- SST and sea ice taken from weekly NOAA OI SST V2.
- Results shown are for forecasts started at 00Z from forecast hour 24 to 48. (2nd Day)

CAM Configurations

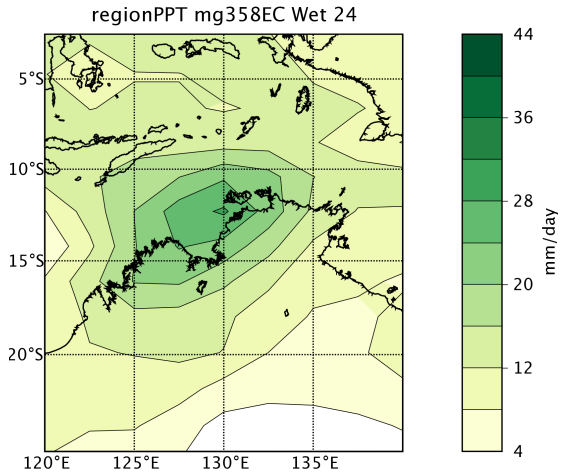
horizontal	vertical	micro physics	boundary layer
1.9° x 2.5°	26	MG	Default
1.9° x 2.5°	26	RK	Default
1.9° x 2.5°	30	MG	UW
1.9° x 2.5°	30	RK	UW
0.9° x 1.25°	26	MG	Default

Table: CAM Configurations

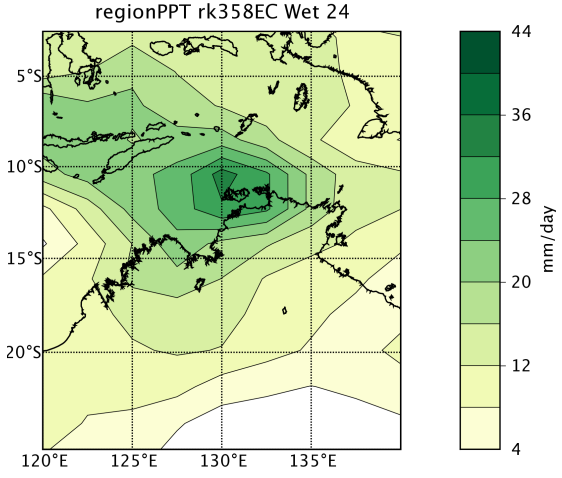
Rainfall - Wet Period 13-25 January 2006



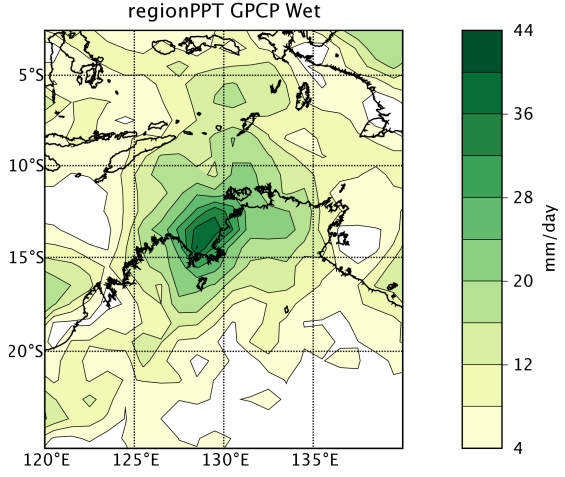
(a) TRMM



(c) MG

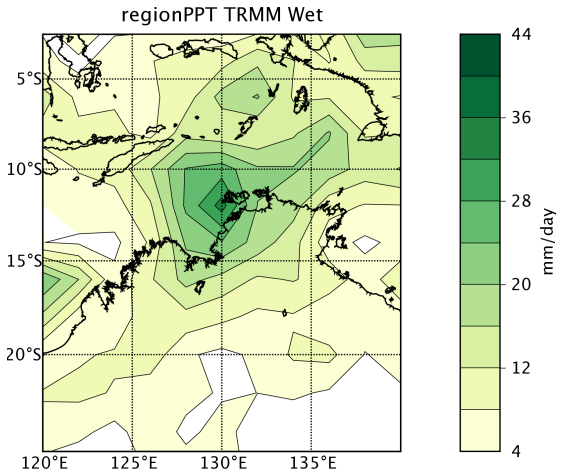


(b) RK



(d) GPCP

Rainfall - Wet Period 13-25 January 2006



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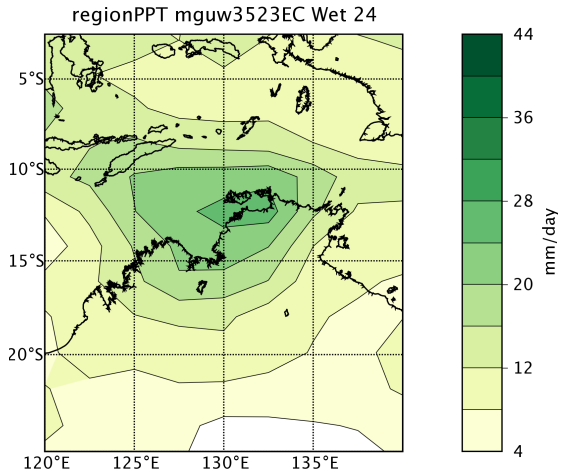
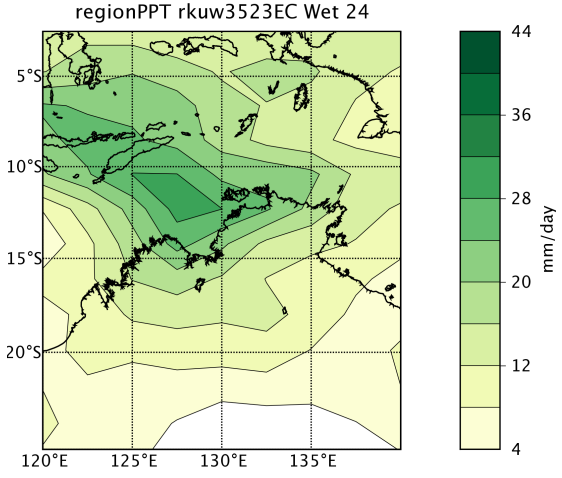


(c) MG-UW



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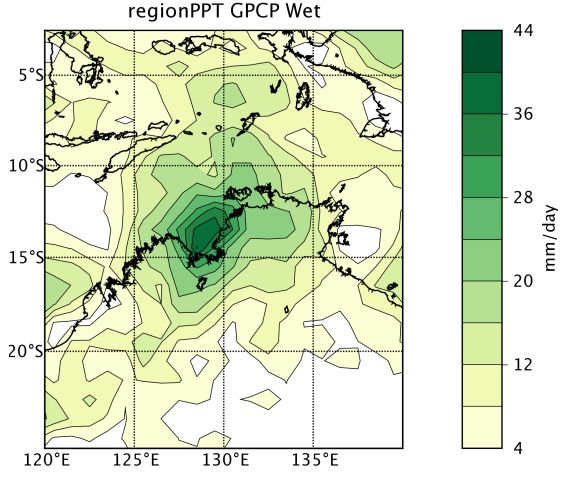

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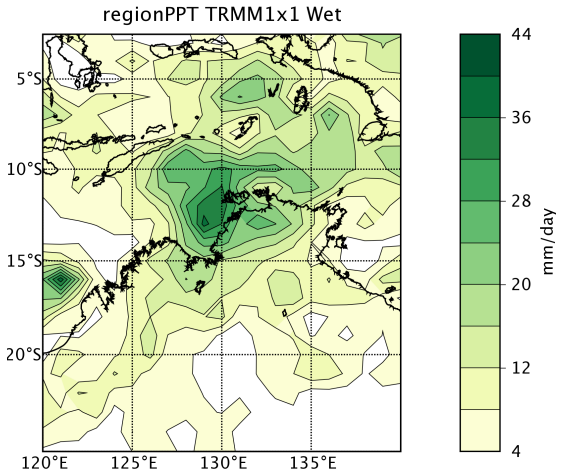
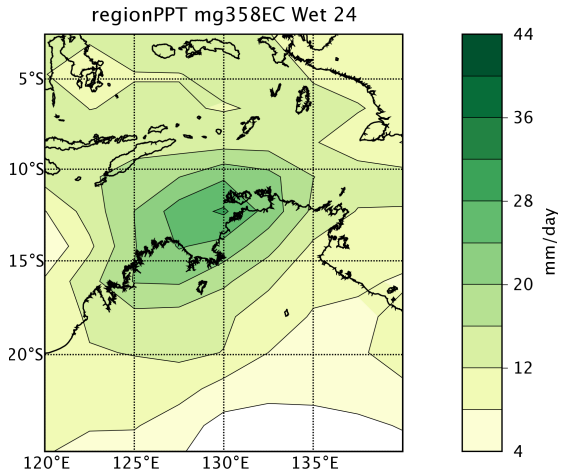


(a) TRMM



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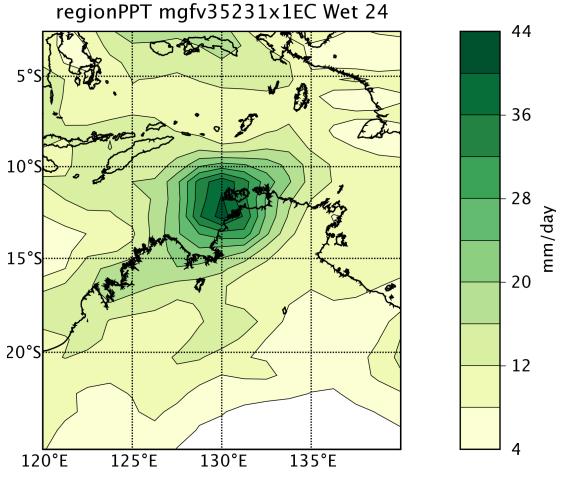
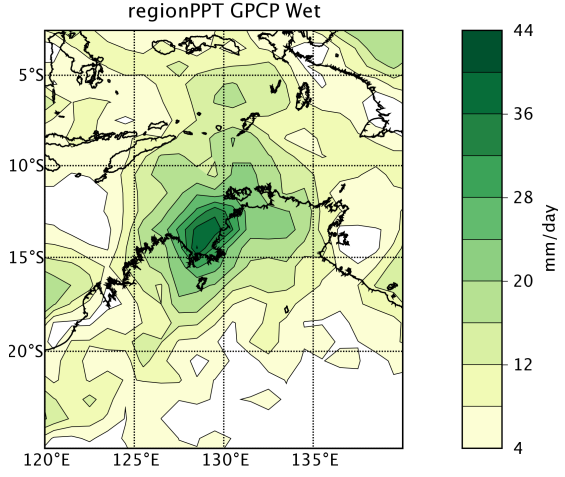
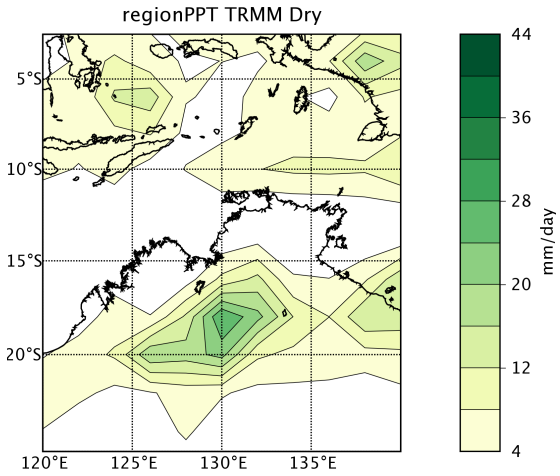


(b) MG-1x1

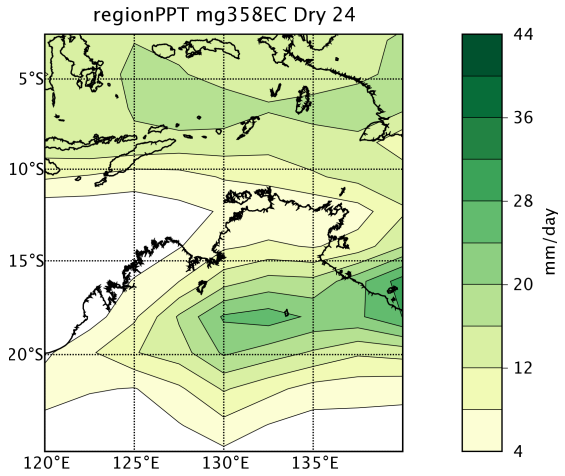


(d) GPCP

Rainfall - Dry Period 26 January - 3 February 2006



(a) TRMM



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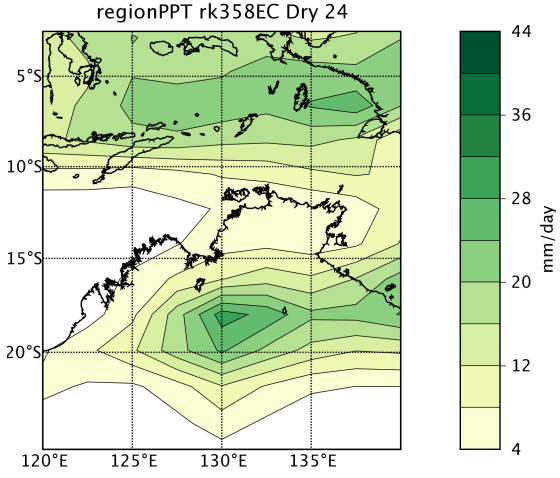
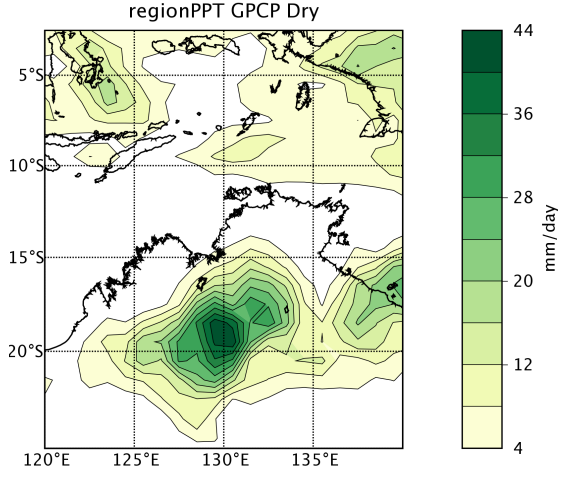


(b) RK



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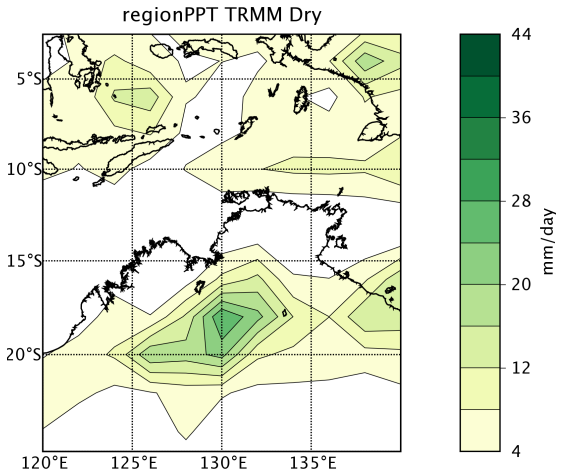
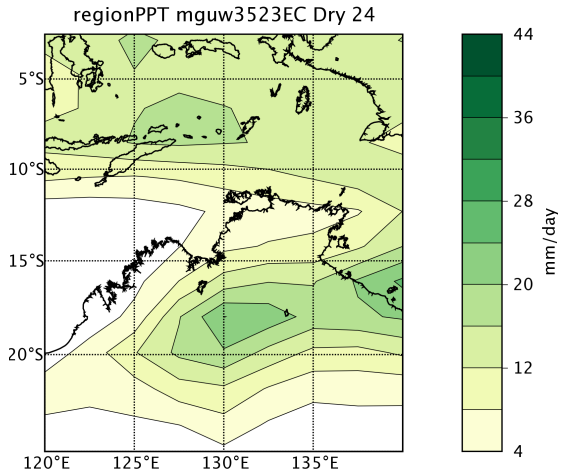


(a) TRMM



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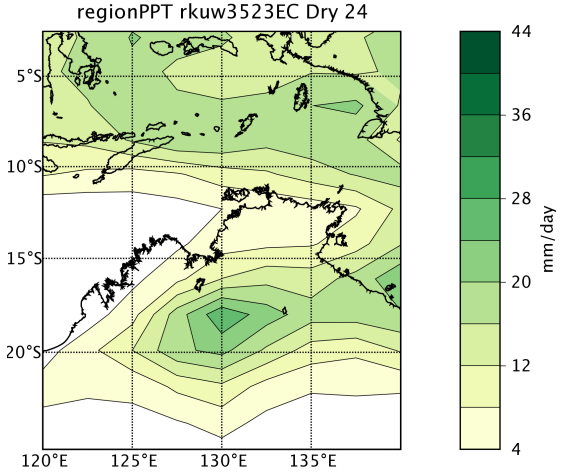

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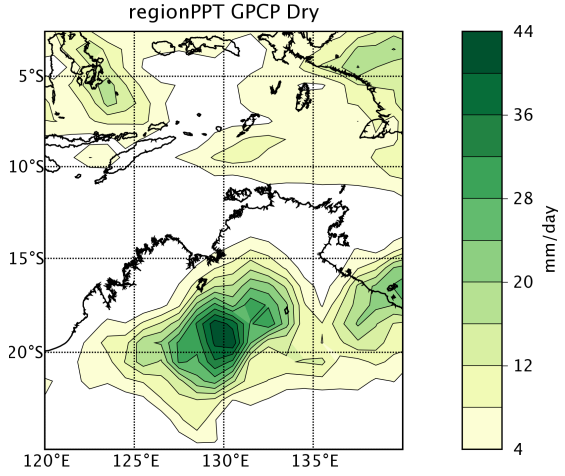

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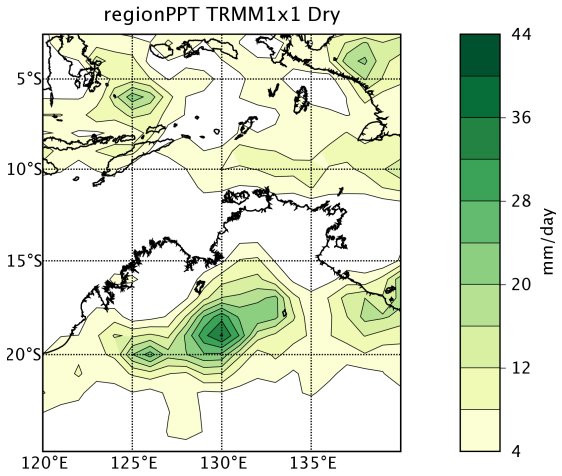
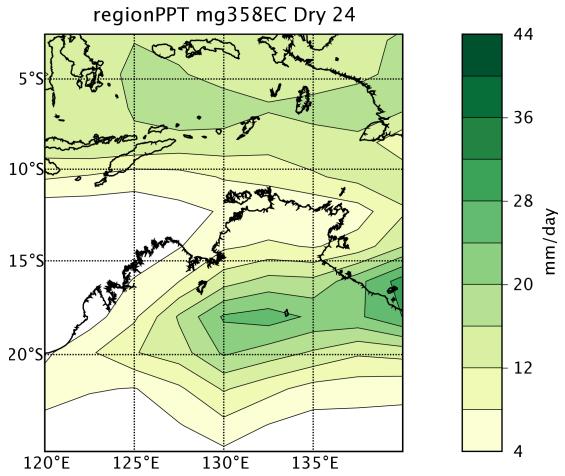
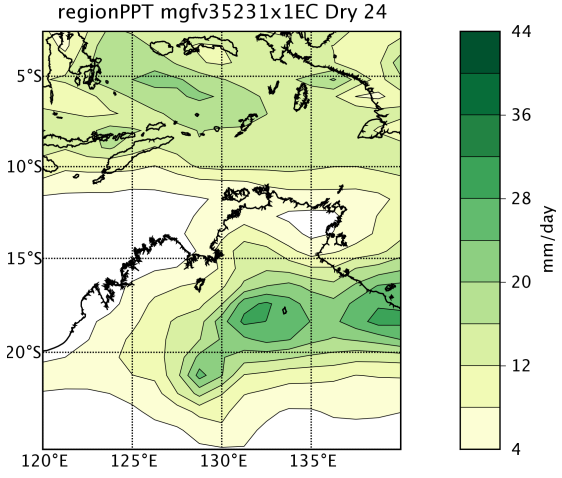


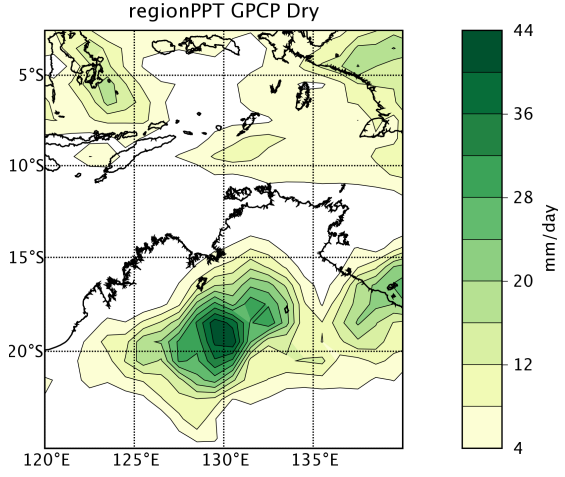
(a) TRMM



(c) MG

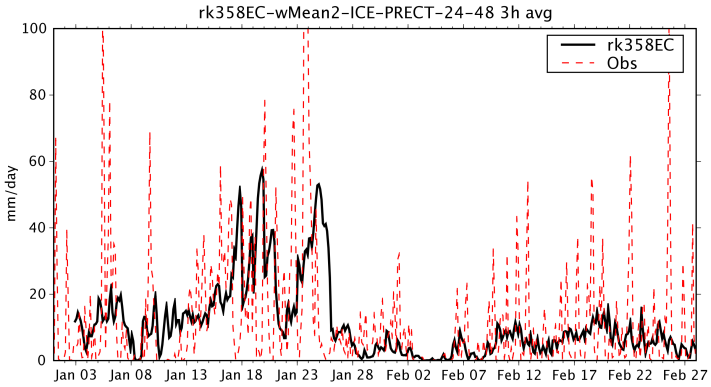


(b) MG-1x1

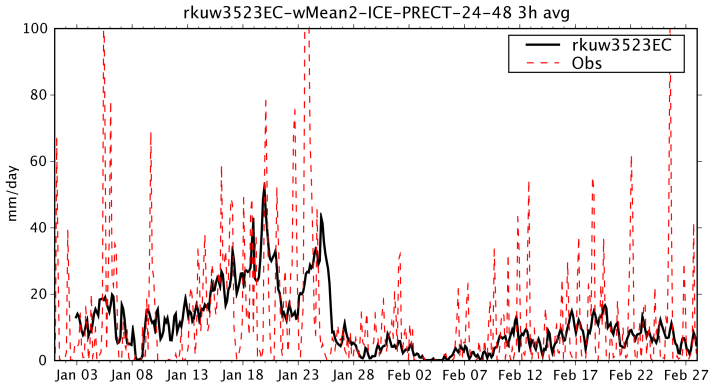


(d) GPCP

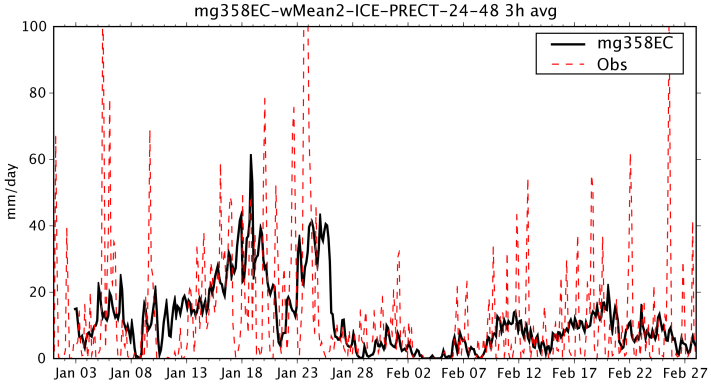
Rainfall at TWP ICE



(a) RK



(c) UWRK



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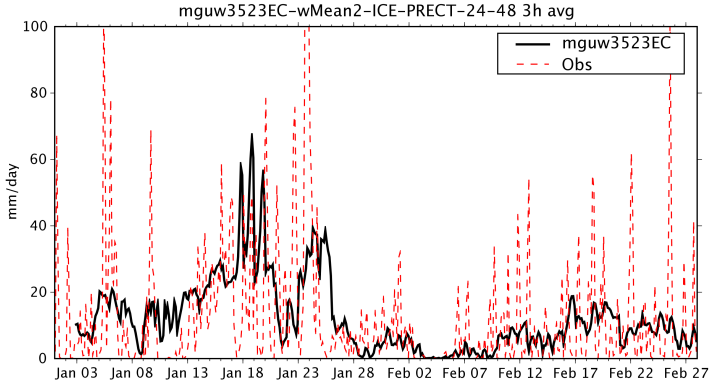
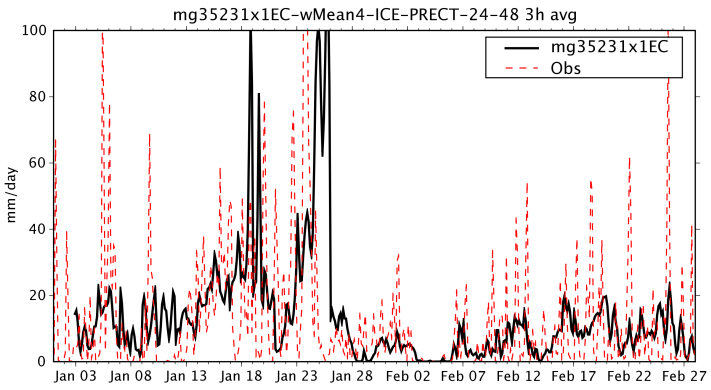
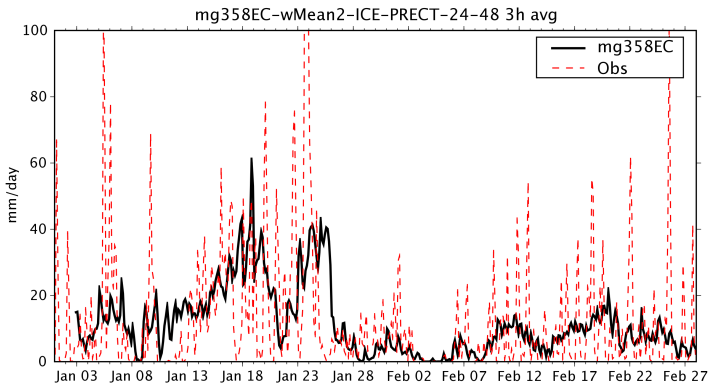


(d) UWMG

Rainfall at TWP ICE

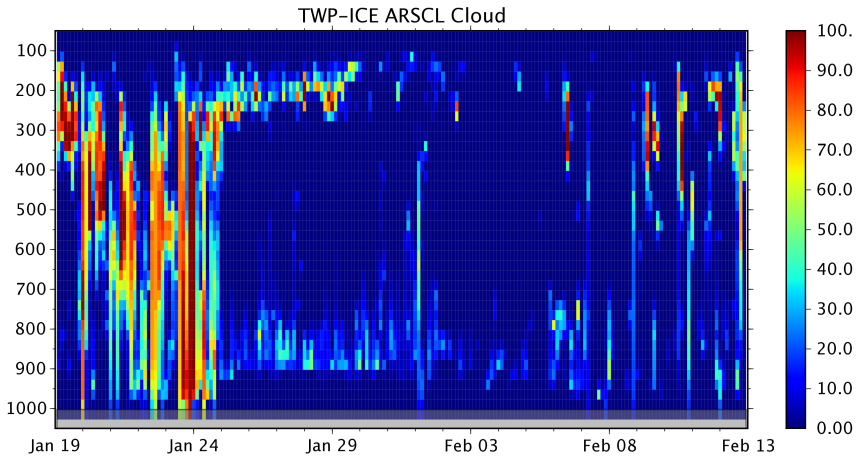


(a) MG1x1

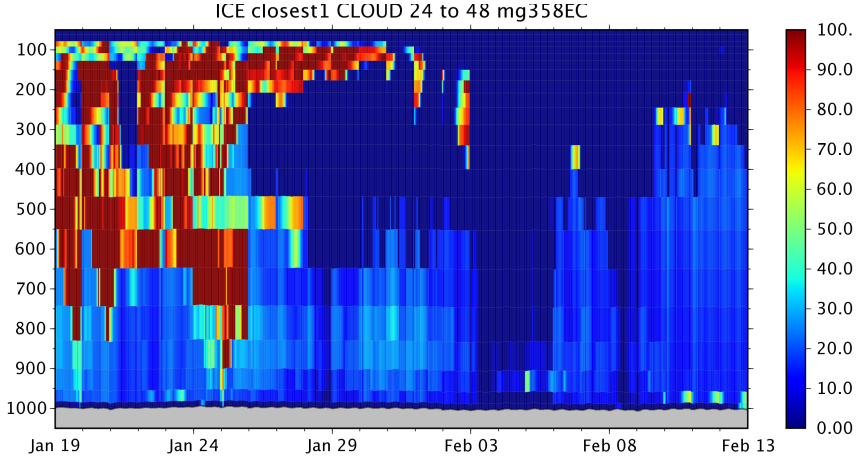


(b) MG

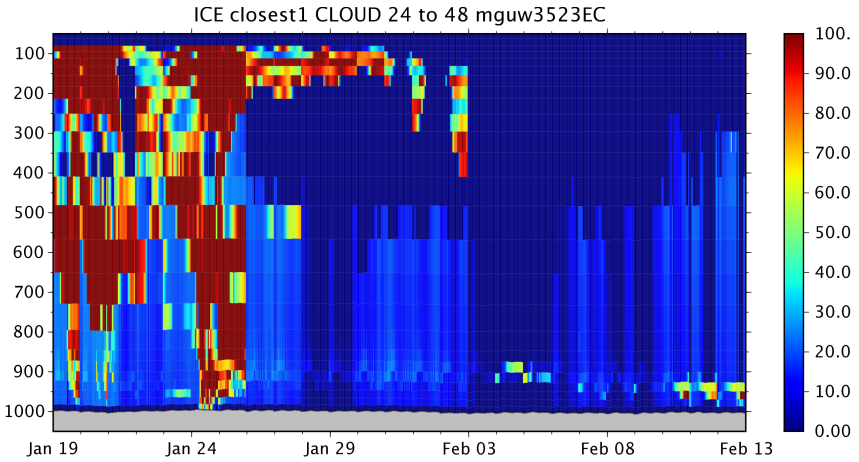
Cloud Fraction at Darwin



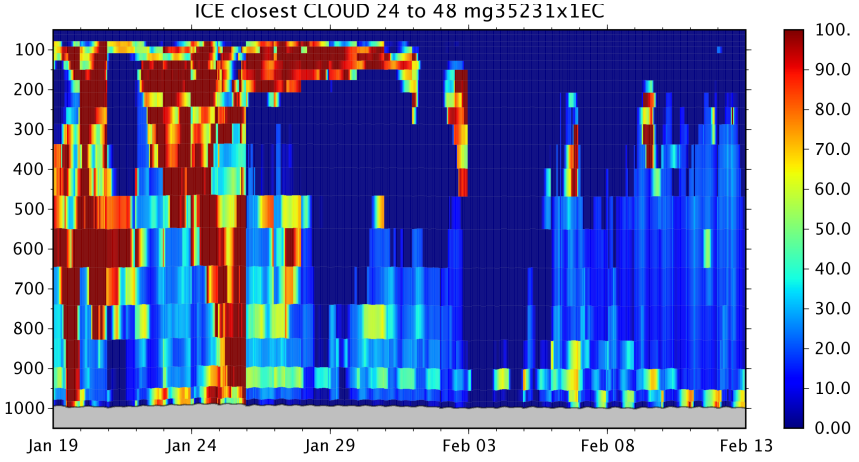
(a) Active Remotely Sensed Cloud-ARSCL



(b) MG

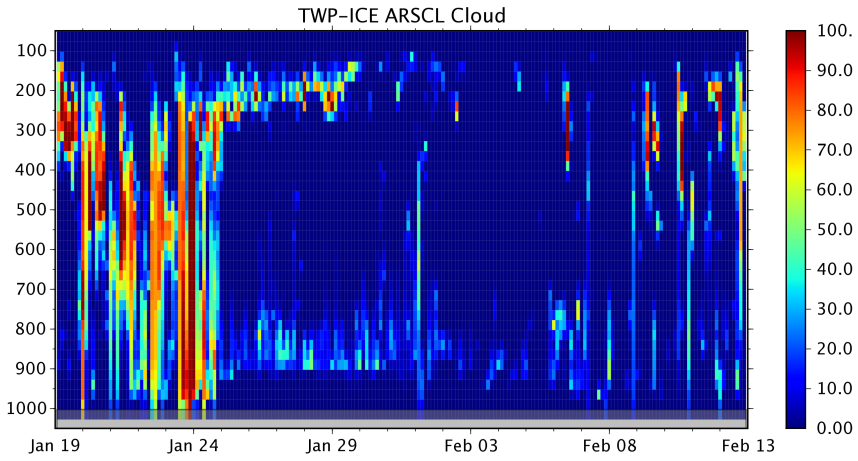


(c) UWMG



(d) 1x1 MG

Cloud Fraction at Darwin



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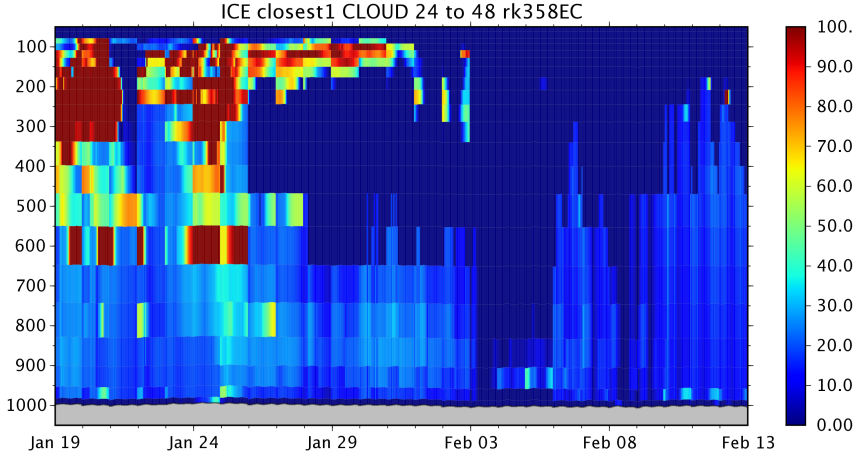
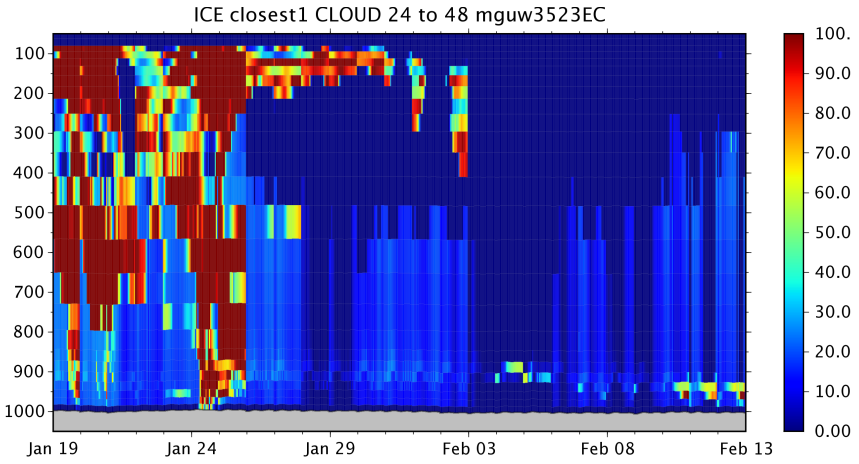


(b) RK



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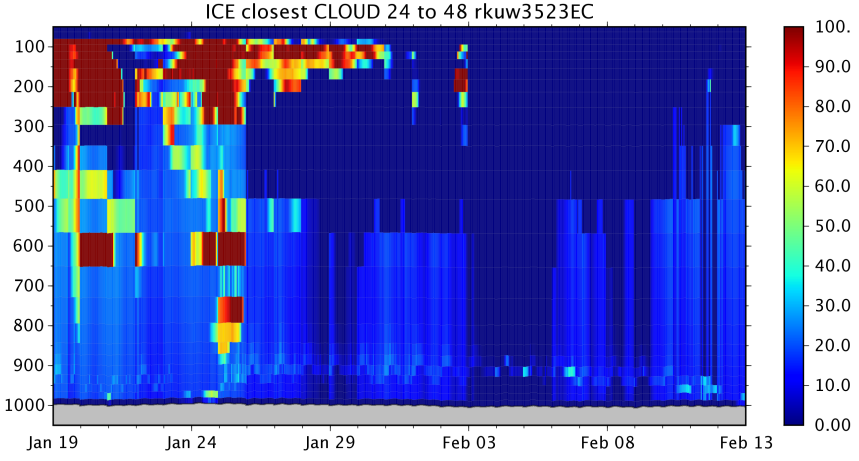
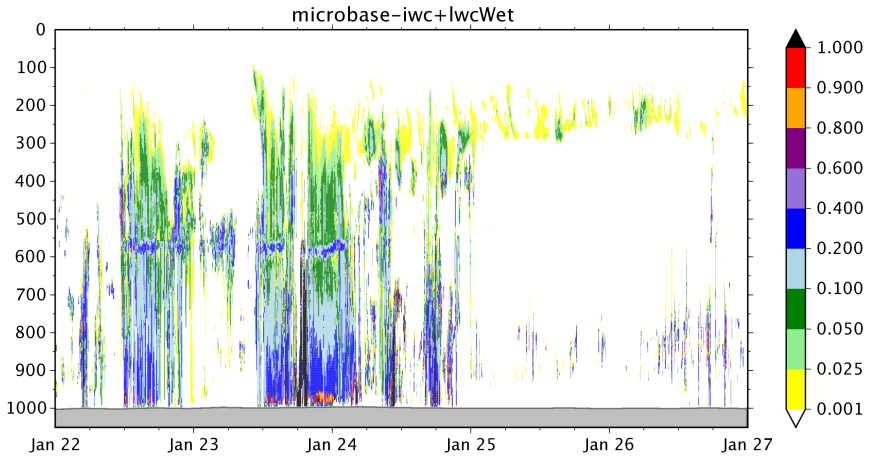
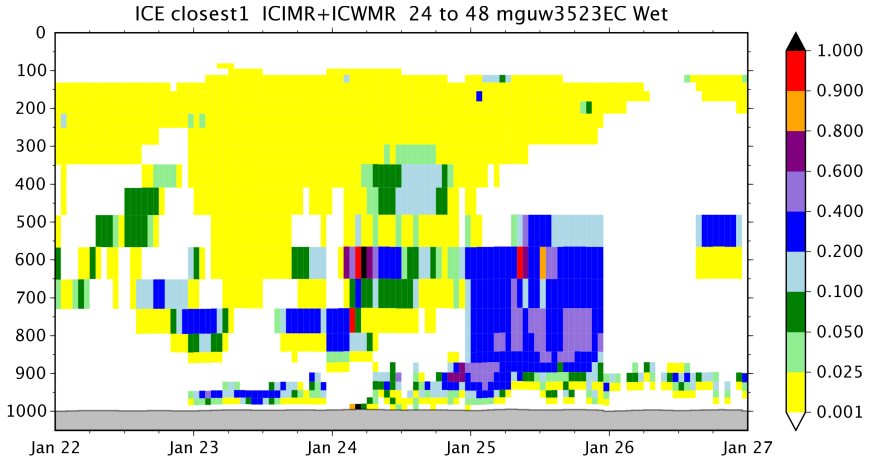


(d) UWRK

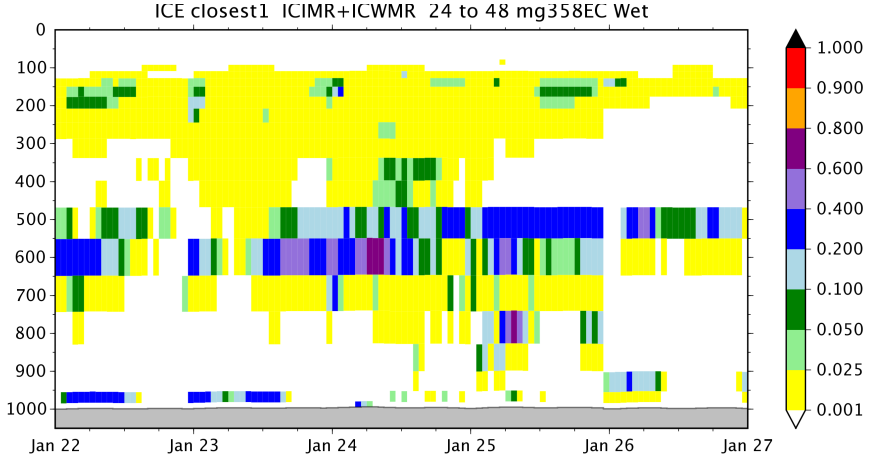
Cloud Ice and Liquid at Darwin Wet Period



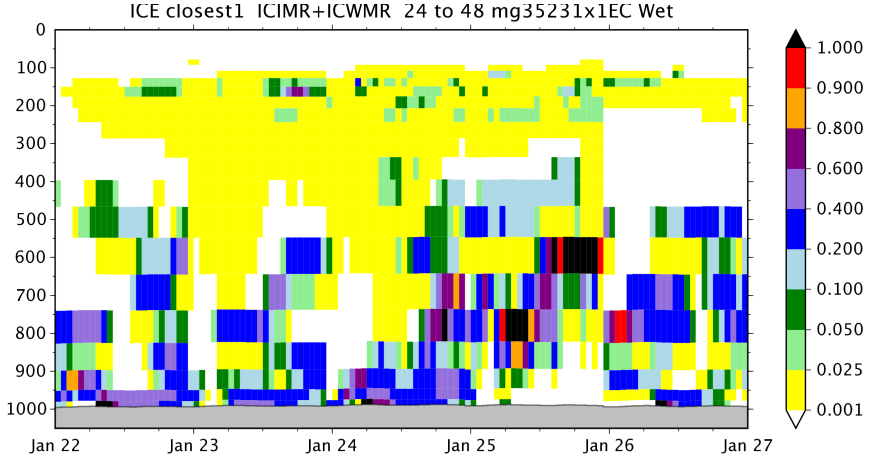
(a) microBase



(c) UWMG

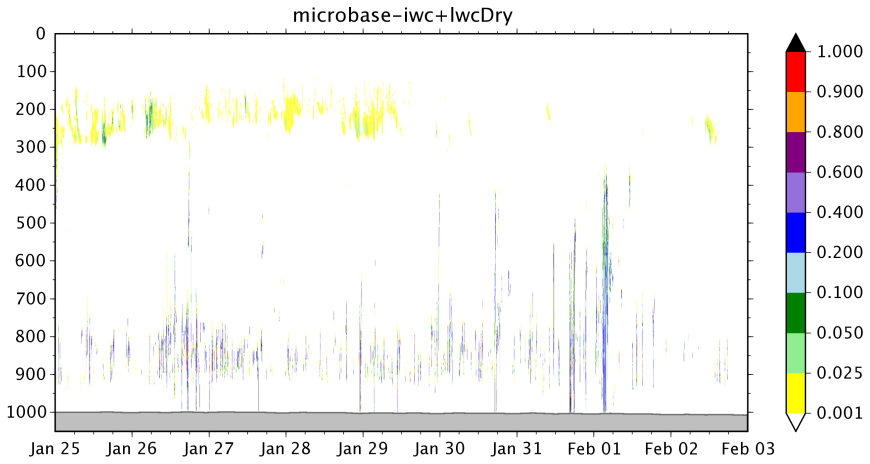


(b) MG

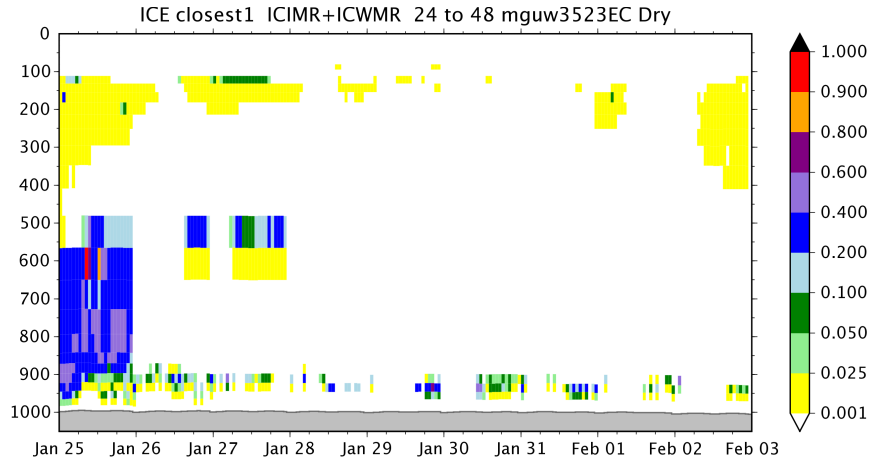


(d) 1x1 MG

Cloud Ice and Liquid at Darwin Dry Period



(a) microBase



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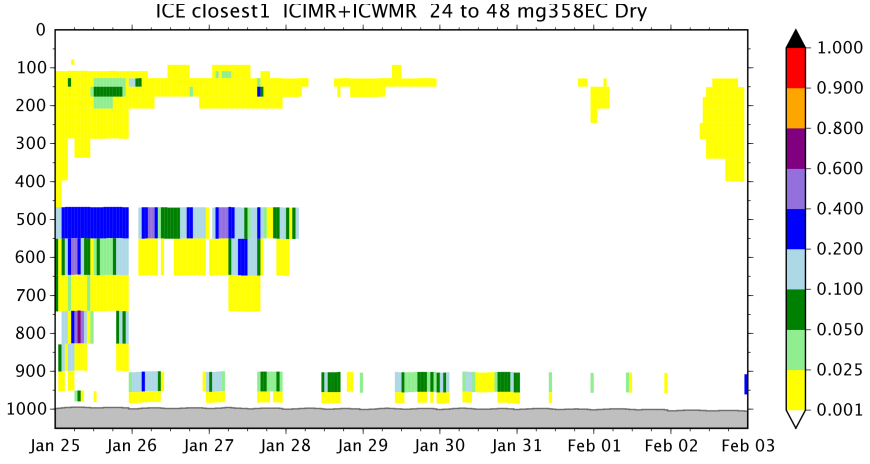
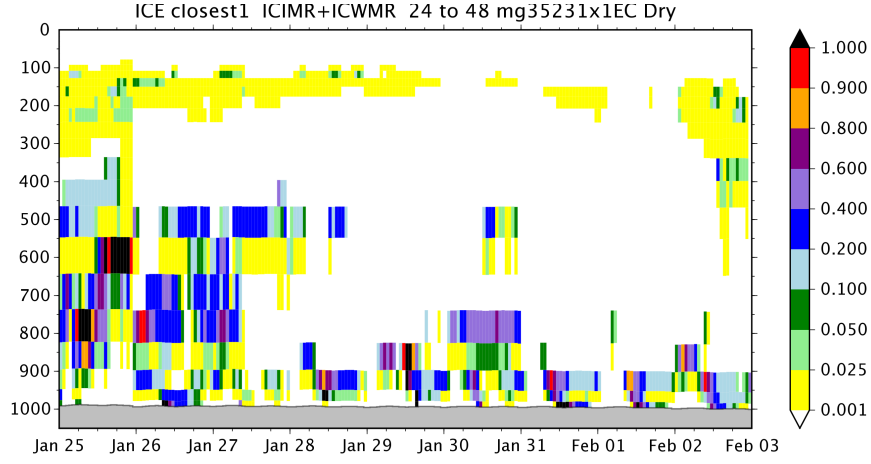
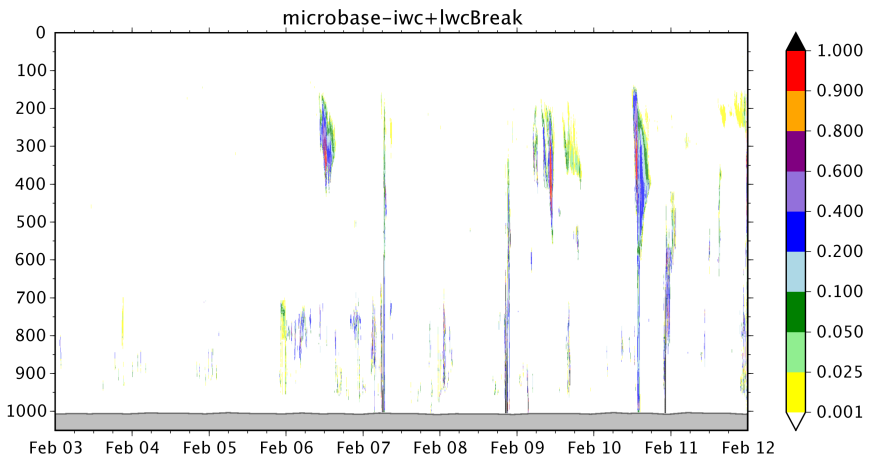


(b) MG



(d) 1x1 MG

Cloud Ice and Liquid at Darwin Break Period



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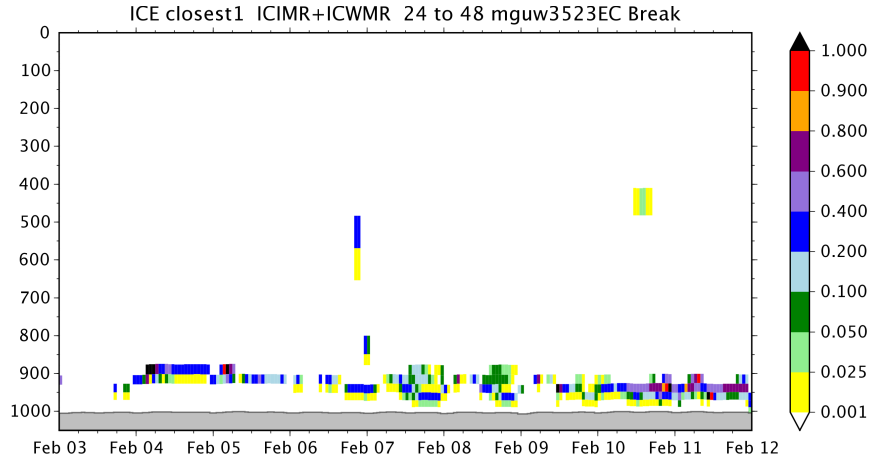
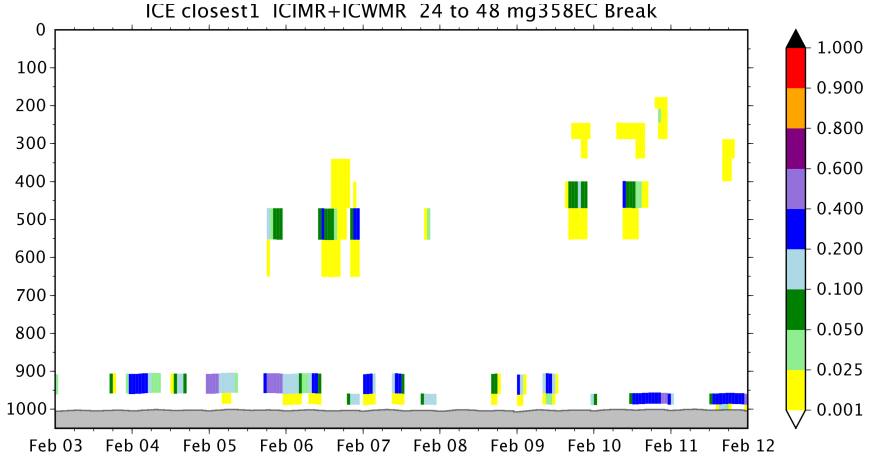
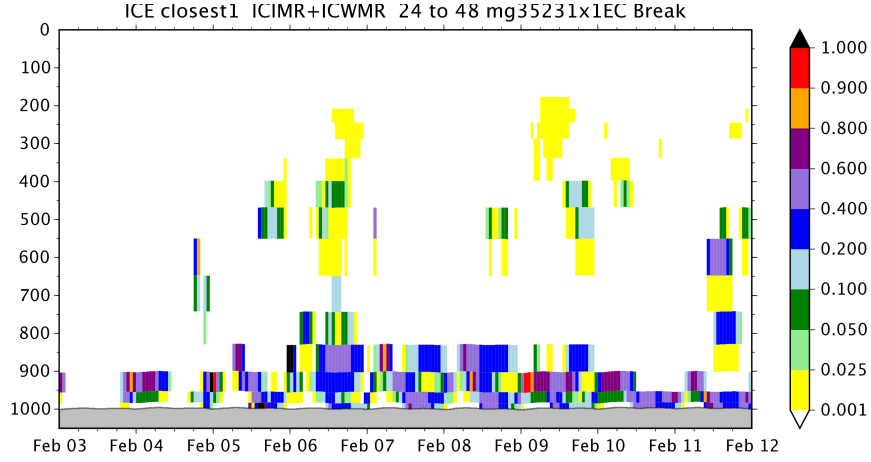


(c) UWMG

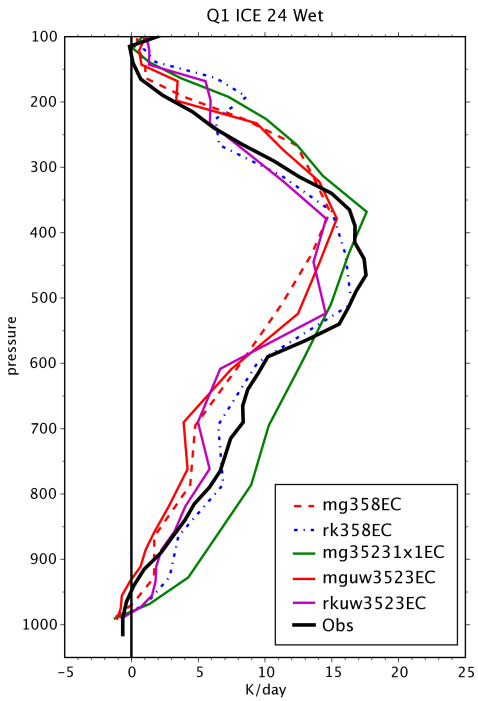


(b) MG



(d) 1x1 MG

Q1 - apparent heat source over TWP ICE



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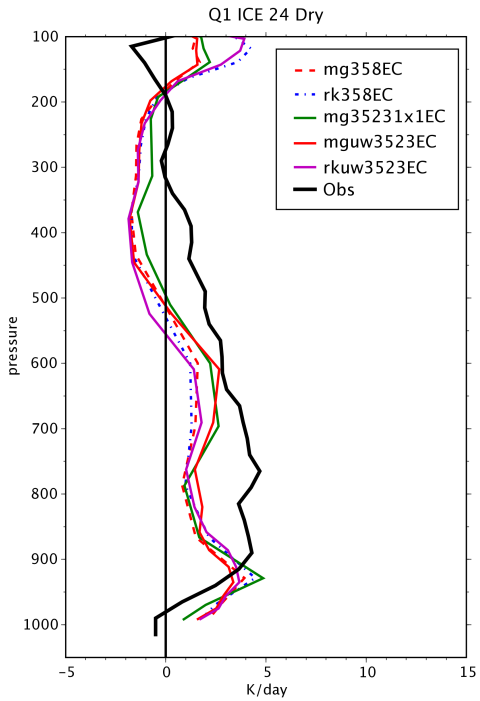
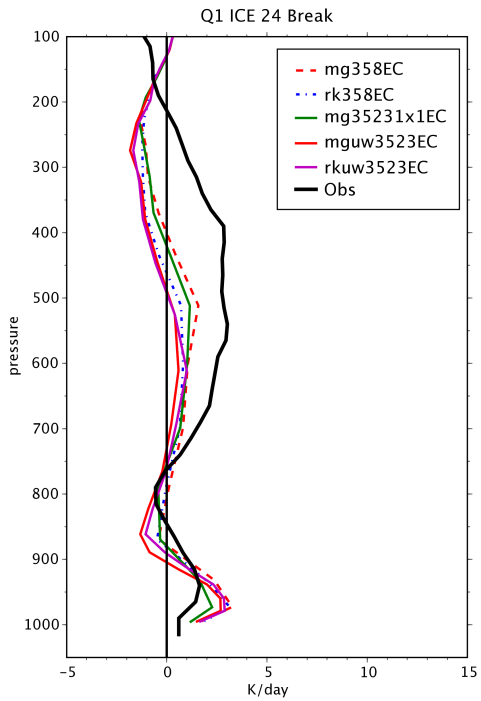
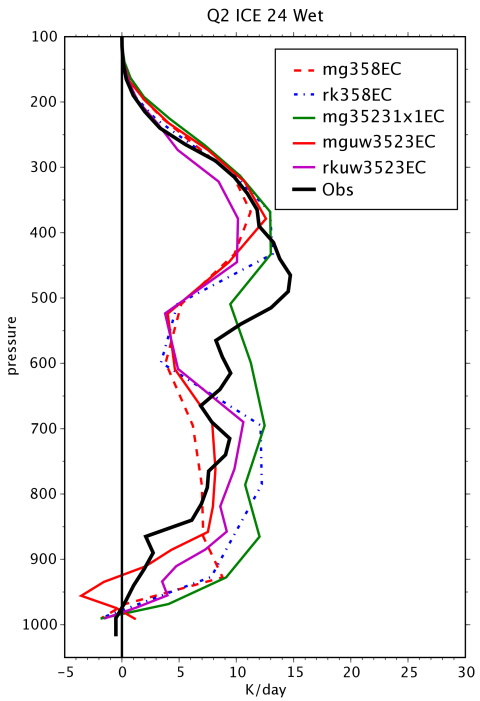


(b) Dry

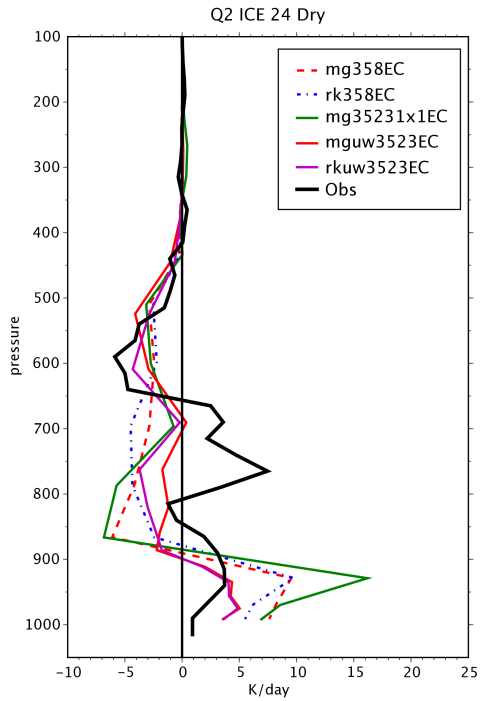


(c) Break

Q2 - apparent moisture sink over TWP ICE



(a) Wet



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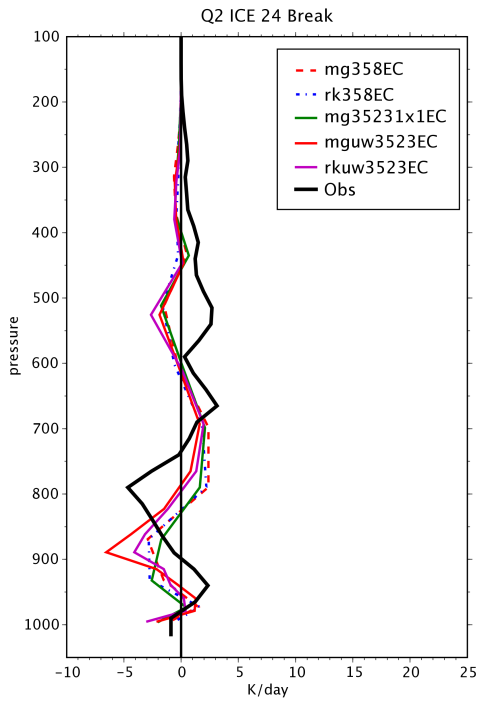
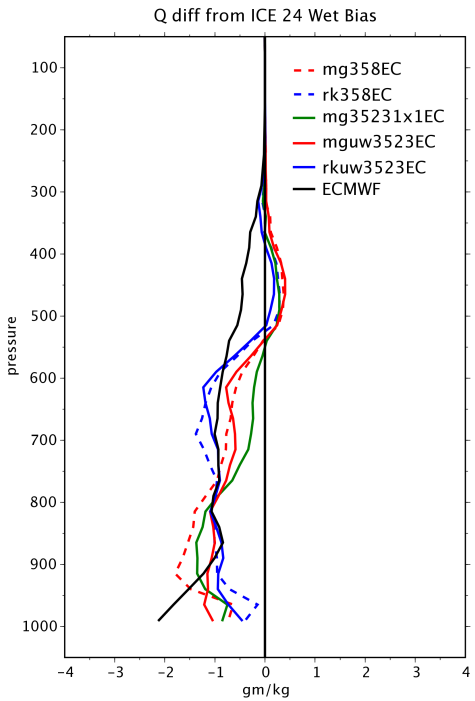
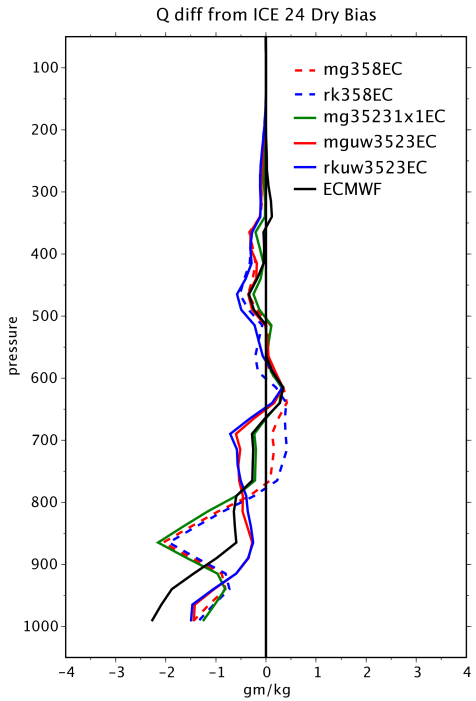


(c) Break

Specific Humidity Bias over TWP ICE



(a) Wet



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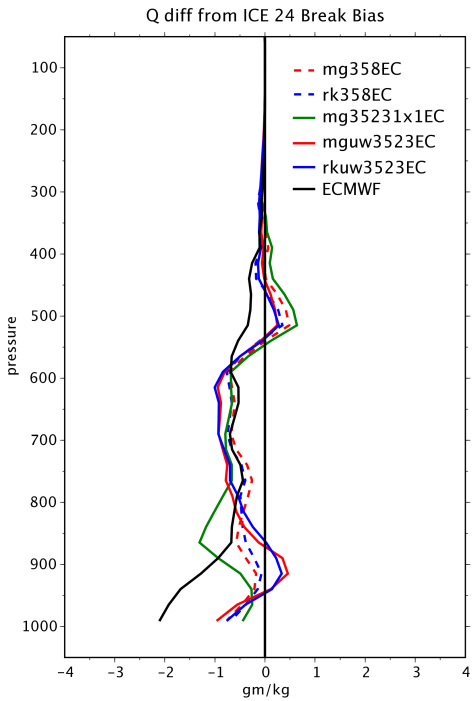
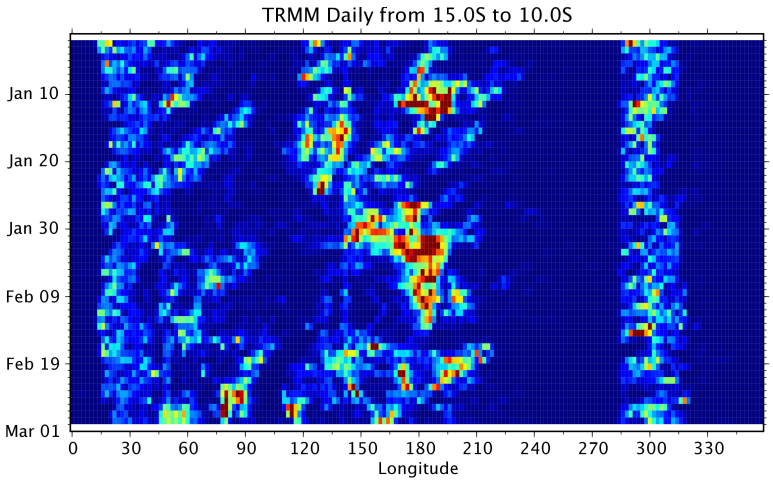
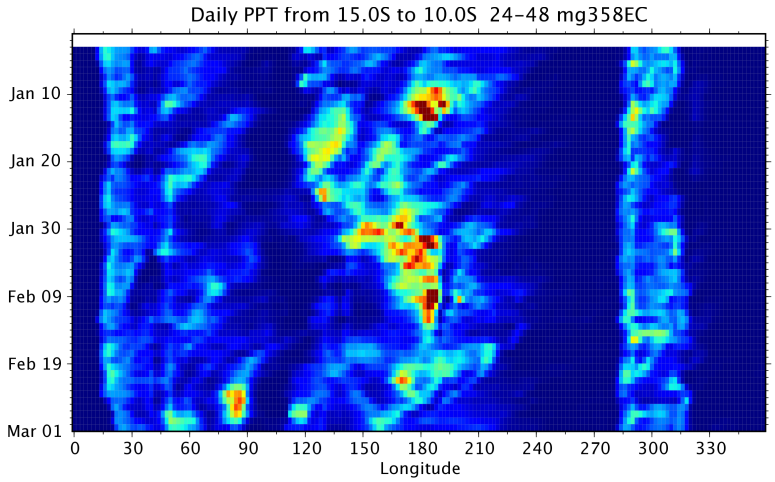


(c) Break

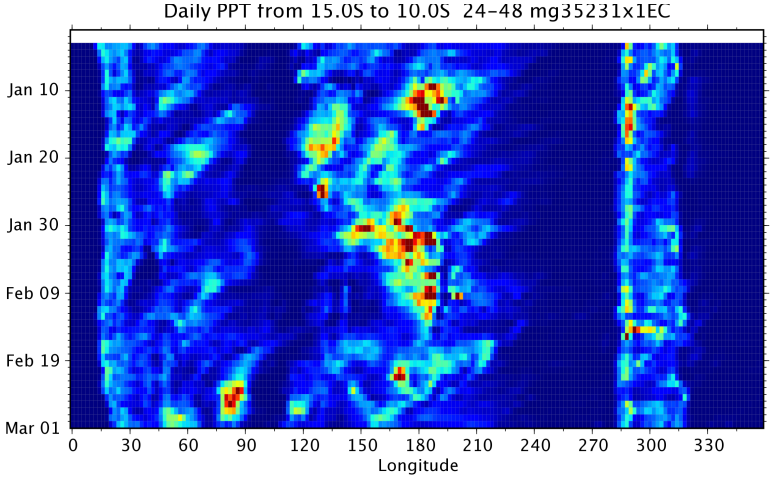
Daily Rainfall from 15S to 10S for January -February 2006



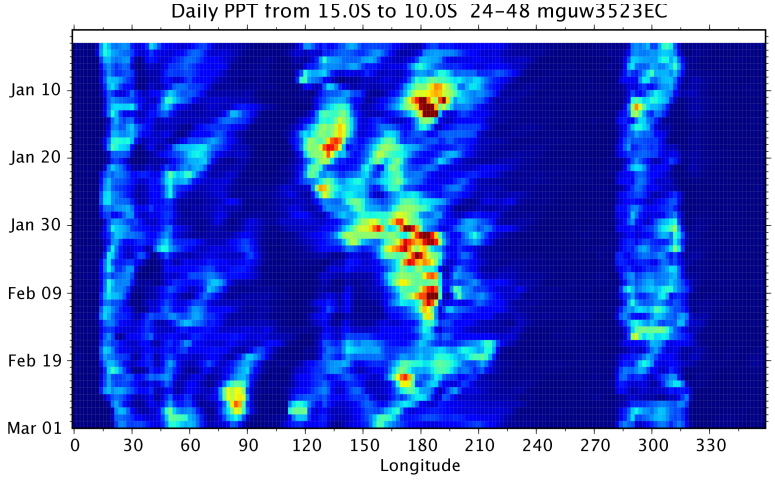
(a) TRMM



(c) MG



(b) 1x1 MG



(d) UWMG

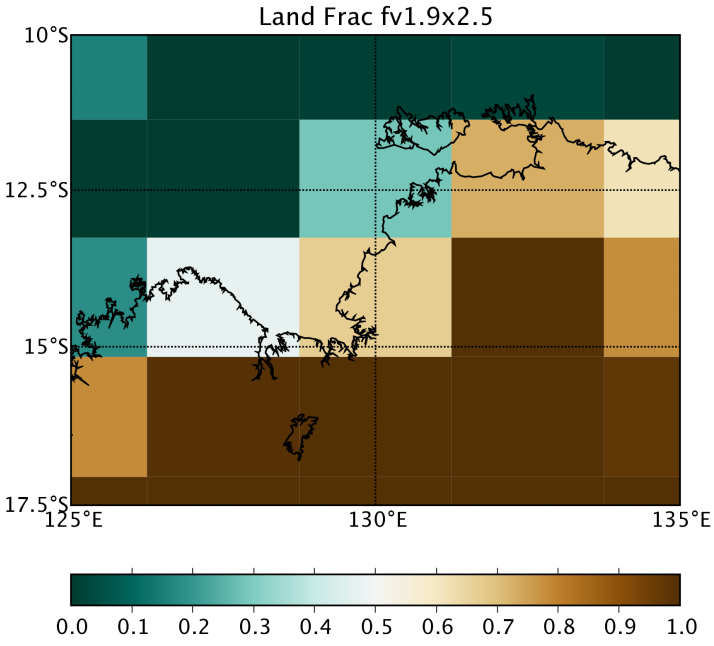
Summary

- Increased horizontal resolution makes a significant difference. The geographical layout of the TWP-ICE experiment provides a test of resolution
- The MG micro-physics does not make an overwhelming difference but does provide a large increase in capability and most differences are positive for the new parameterizations.
- The use of UW PBL likewise does not make a large impact (some positive) for this specific experiment.
- CAM 3.5 shows a path to marked improvement at least in this limited arena of short range tropical forecasts.

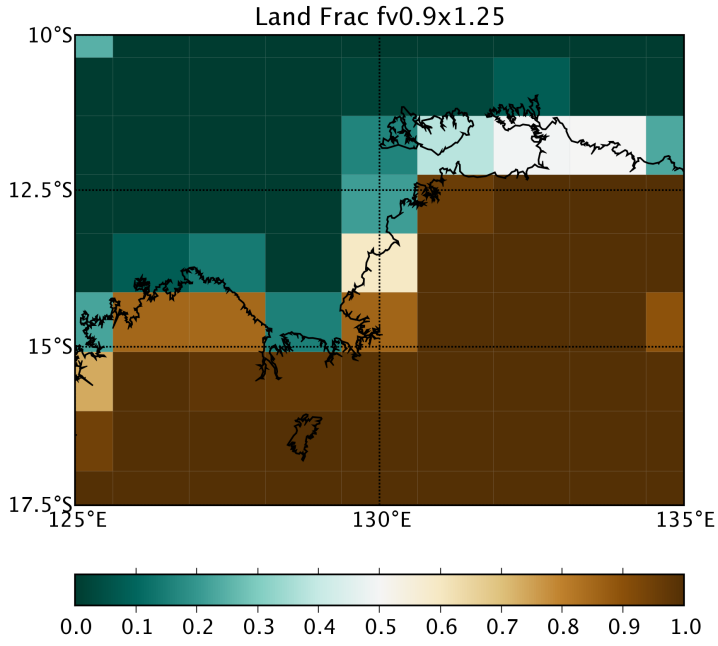
Acknowledgments

- Jim Mather and Sally McFarlane at PNNL for cloud ice/water
- ARM TWP-ICE variational analysis archive (S. Xie)
- H. Morrison and A. Gettleman for help with CAM.
- ECMWF for operational analysis data used in initializing the models.

Comparing Two CAM resolutions

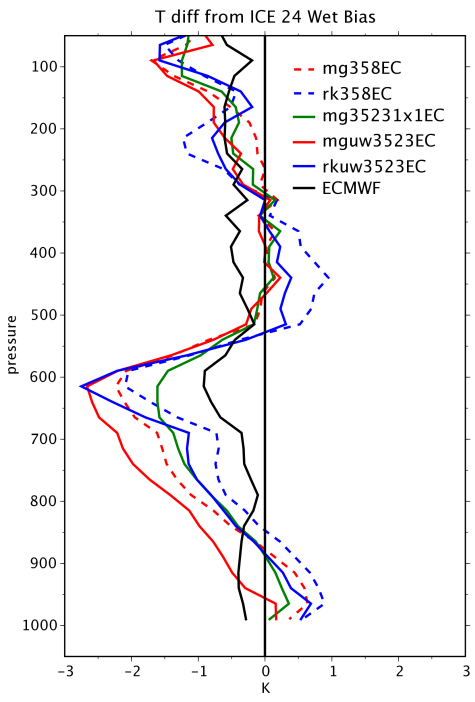


(a) 1.9 x 2.5

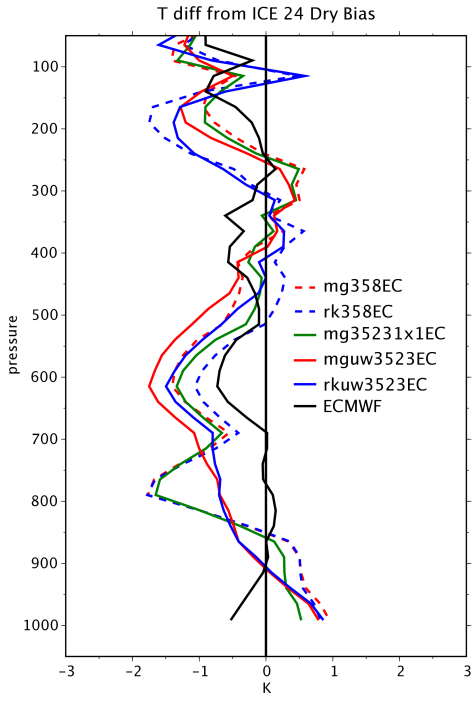


(b) 0.9 x 1.25

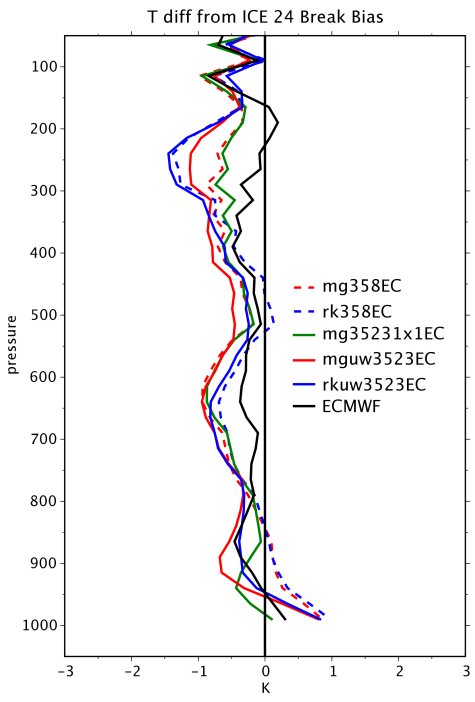
Temperature Bias over TWP ICE



(a) Wet

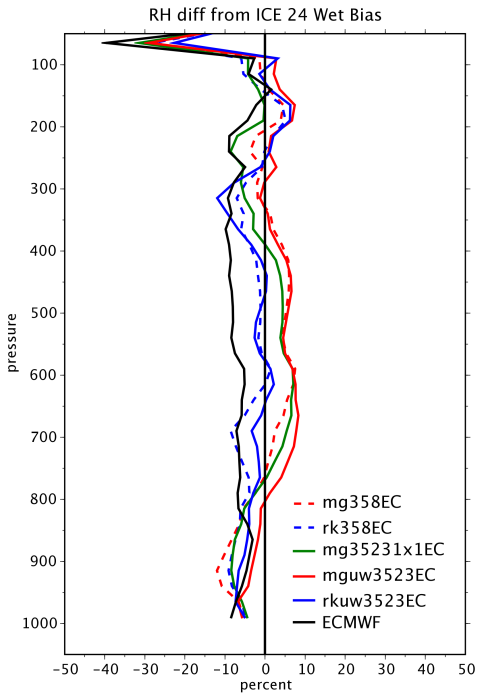


(b) Dry

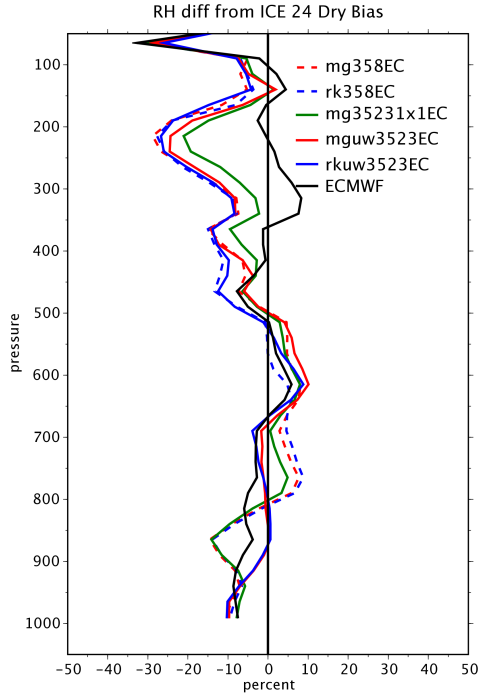


(c) Break

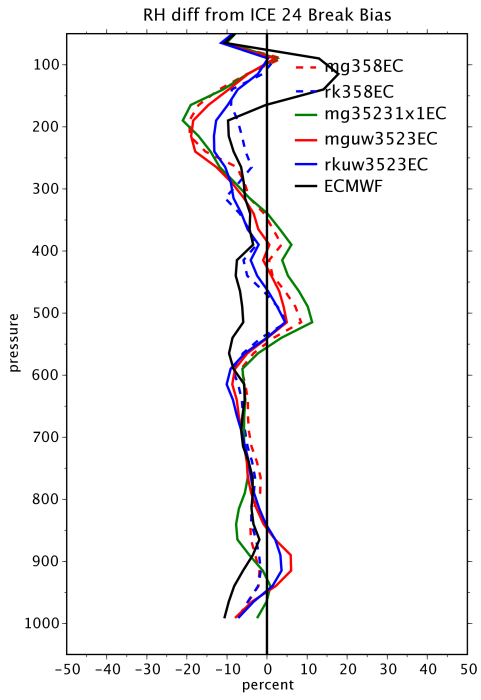
RH Bias over TWP ICE



(a) Wet

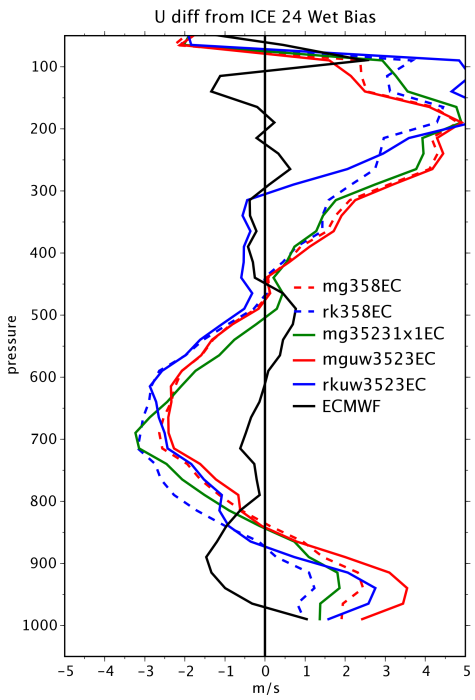


(b) Dry

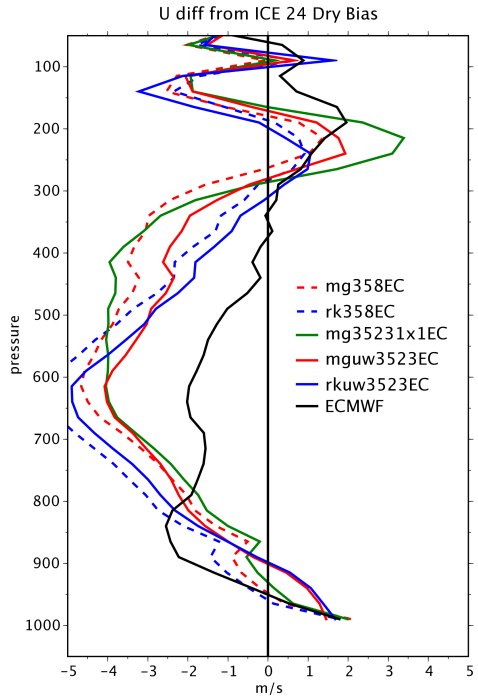


(c) Break

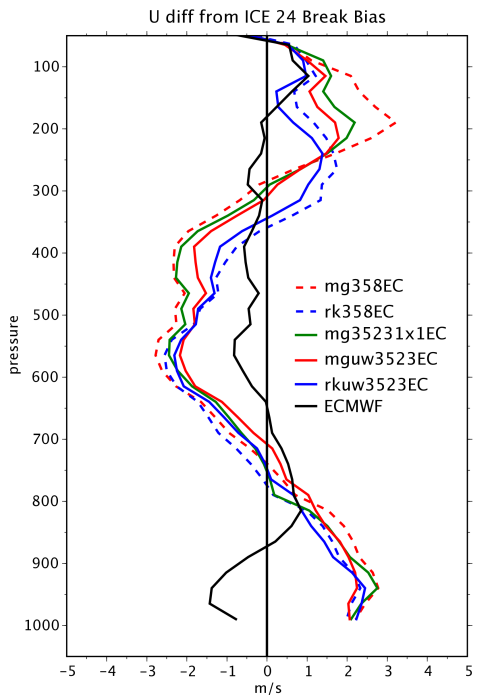
Zonal Wind Bias over TWP ICE



(a) Wet



(b) Dry



(c) Break

Active Remotely Sensed Cloud (ARSCL) at Darwin

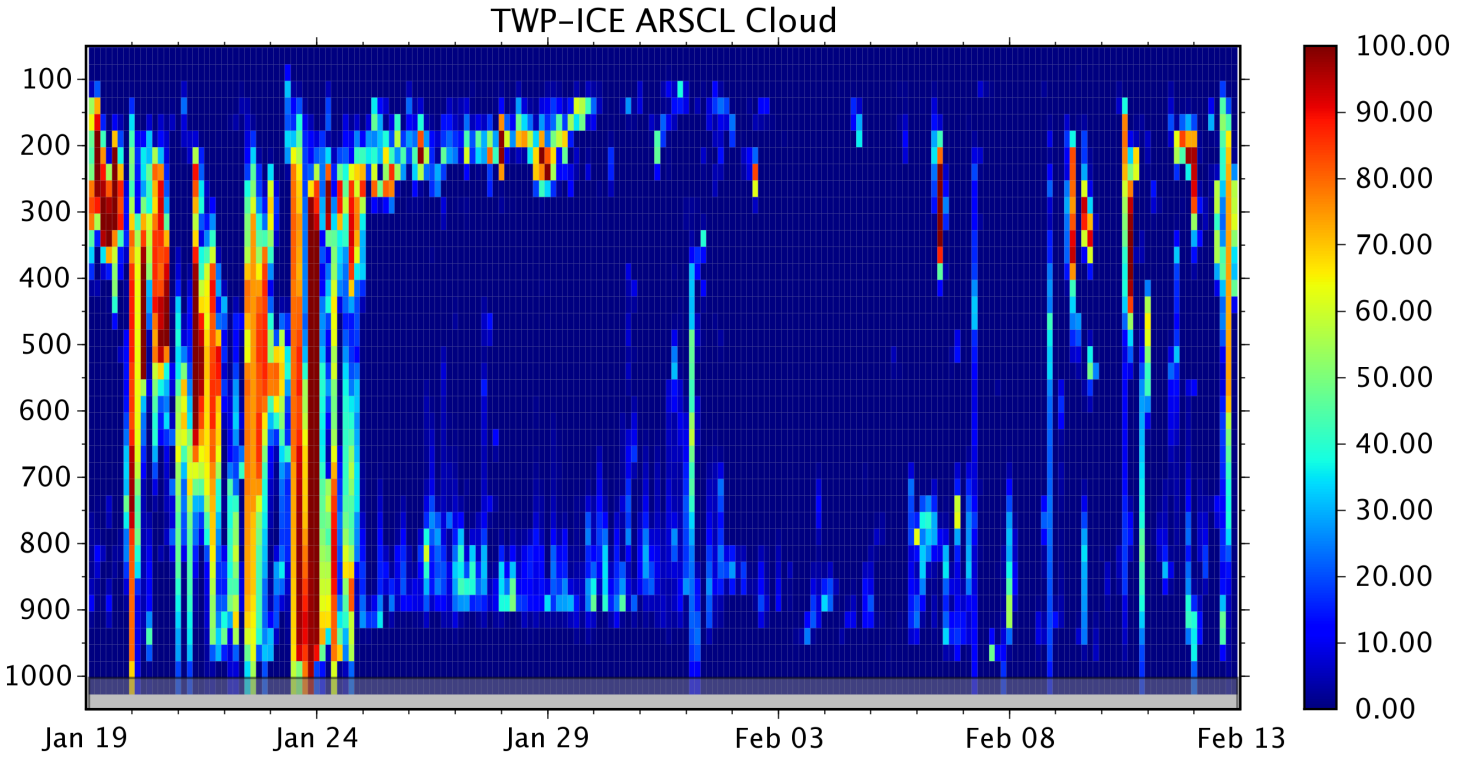


Figure: Time-Pressure of ARSCL cloud fraction estimates for the TWP-ICE experiment. Data is from instruments located only at Darwin.

Tropical Warm Pool-International Cloud Experiment (TWP-ICE)

- 13 - 25 January Wet (active) Monsoon across Northern Australia
- 26 January - 2 February Dry Monsoon (LandFoon) - inland monsoon low
- 3 - 13 February Break Period - inland heat trough - afternoon/evening storms on trough/seabreeze boundary.